Paradox of the Jabulani Soccer Ball: Is Determinism Better for Scoring?

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Abstract

In this paper, we provide a game-theory-type explanation for the recently observed paradox: that a soccer ball designed to make the trajectories more predictable and thus, to increase the scoring, has actually led to a significant scoring decrease at the 2010 World Cup.

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How to make soccer more popular in the US?

One of the reasons why soccer is not as popular in the US as it is in many other countries is that the typical soccer scores are much lower than in many other sports.

To improve this situation, in preparation for the 2010 World Cup, the world Soccer Federation FIFA decided to introduce a new soccer ball named Jabulani.

One of the main purposes for introducing a new ball was to make its trajectories more predictable and therefore, to increase the scoring.

A reason for low scoring. One of the reasons why the trajectory of a traditional soccer ball is not fully predictable is that the ball – while spherical in shape – is not fully spherically symmetric.

Specifically, the surface of the traditional soccer ball consists of 14 panels. The seams between the panels are clearly visible and affect the way the ball reacts to a kick. As a result, the trajectory of a ball depends on such whether the kick is concentrated on the middle of the panel or on the connecting seam. The soccer ball moves and rotates fast, and, in the heat of a game, it is practically impossible to select an appropriate kicking point – even kicking the ball at all is sometimes difficult to achieve.
Jabulani: a solution to the predictability problem. To avoid the predictability problem, the Jabulani ball is made much rounder:

- its surface consists of only eight panels, and
- these panels are thermally bonded – to minimize the effect of the seams.

Experiments with the Jabulani showed that it is indeed more predictable. This is confirmed both
- by the measurements (see, e.g., [2]), and
- by the FIFA experts who played with this ball.

Paradox: the Jabulani did not lead to the desired scoring increase. Contrary to the expectations, at the World Cup, the Jabulani not only did not increase the scoring, the scores actually decreased. For example, after the first 14 games,

- the average number of goals per game was 1.64,
- much smaller that the 2006 World Cup 14-game average of 2.21; see, e.g., [4].

Proposed explanations. There is a lot of discussion on the possible role of different factors in this scoring decrease.

- Some of the explanations are more sociological: the players have not yet learned how to handle this ball, since it has only been recently introduced.
- Other explanations are more physical:
  - players from most countries are accustomed to playing at approximately the sea level;
  - on the other hand, the current World Cup is at an elevation where the air is thinner and thus, the ball trajectories are different.

The general aspect of the paradox: what we plan to do in this paper. Instead of going into sociological and/or physical details of the problem, let us consider a general question: is the trajectory predictability indeed better for scoring?

This is the question that we plan to analyze in this paper. Specifically, we provide a purely game-theory-type explanation to this problem.
Case of good (but not perfect) players: scoring does increase. Let us first consider the case of good soccer players, i.e., professional- or semi-professional level players of the type that tested the new ball. They may not all necessarily be on the level of the best World Cup players, but they were good enough to be considered experts in soccer.

In a regular soccer game, one of the main reasons why not all the goal attempts result in a goal is that many times, a player kicks the ball from a reasonable distance, and at that distance, it is difficult to kick exactly into the opposite team’s goal – and it is even more difficult to kick the ball into the part of the goal which is the farthest away from the goalkeeper’s current location. One of the reasons for this difficulty is that, as we have mentioned, the trajectory of a traditional soccer ball is not very predictable. Thus, if we could make the ball more predictable, this could potentially increase scoring.

This was the logic behind the idea of making the soccer ball trajectories more predictable. And indeed, when such a more predictable soccer ball was designed, in the test games, the scoring improved – because there were fewer misses caused by the ball’s unpredictability.

Case of World Cup-class players. The above argument about the expected increase in scoring works well when a player hits the empty goal – or the goal in which a goalkeeper is very probable to miss the ball unless it is headed straight to him. In other words, the above argument works if we consider a soccer game as, in effect, an optimization problem – how to increase the efficiency of a goal-attempting kick.

However, at the World Cup level, goalkeepers are usually much more efficient, they capture a larger portion of the balls aimed at their goals. A skilled goalkeeper is able to intuitively “predict” where the ball is headed, rush to that part of his goal, and capture the ball.

In other words, for players of the World Cup level, we must take into account the actions of both sides – i.e., treat the situation more like a game-theoretic problem than as pure optimization; see, e.g., [1, 3, 5].

Sometimes, a goalkeeper misses the goal because the attacking player is too close and there is no time for the goalkeeper to jump and catch that ball. However, in most cases, the reason why the goalkeeper misses the ball is that he is not able to exactly predict where exactly the ball is heading.

In the ideal case when the ball’s trajectory is fully predictable,

- the attacking player can aim at exactly the desired spot – but at the same time,
- the goalkeeper is also able to perfectly predict where the goal is aimed and thus, is able to catch it.

In other words,
• while it is true that it is difficult to score with an unpredictable ball – because it is difficult to aim at the right spot,

• on the level of the World Cup players, it is also difficult to score with a perfectly predictable ball – because then,

  – not only the attacking player can predict the ball’s trajectory and aim at the right spot,

  – but also the goalkeeper – or a defending player from the opposite team – can also predict the ball’s trajectory and thus, capture the ball before it scores.

**Conclusion.** Both unpredictability and perfect predictability are bad for scoring. Thus, to maximize the scoring, we must introduce a certain degree of unpredictability.

This optimal degree of unpredictability depends on the level of the players’ skills. As we have mentioned, for good players, the perfectly predictable ball does increase scoring, so the optimal level of unpredictability is very low.

However, the more skilled the players, the easier they can predict the trajectories. Thus, the more skilled the players, the more unpredictability we need to add to achieve better scoring. Hopefully, such a level will be determined by the next World Cup, and in 2014, we will indeed see a significant increase in scoring.

**References**


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